ISBN 978-602-14917-7-5
The First International Conference of Food and Agriculture

Effect of Modification Diet on The Body Weight of Sprague dawley Rats

A N S Restuti[1], A Yulianti [1], and N Nuraini[2]

[1]Clinical Nutrition Study Program, Health Department, Polytechnic of Jember
Jalan Mastrip Kotak Pos 164 Jember 68101, Indonesia
[2]Medical Record Study Program, Health Department, Polytechnic of Jember
Jalan Mastrip Kotak Pos 164 Jember 68101, Indonesia

arisanty@polije.ac.id

Abstract. Overweight can be due to increased consumption of high energy foods such as fats and carbohydrates with low physical activity. High-fat diets and carbohydrates with less physical activity lead to an increase in the rate of fat accumulation. Fat will be deposited in the periphery and central, central fat deposits trigger the process of lipolysis to produce free fatty acids that cause increased production of glucose in the liver, reducing the absorption of glucose in the muscle and inhibits the absorption of insulin into the liver. This study aims to determine the effect of modified diet compared to standard feed (Rat Bio) on the weight of Sprangue dawley rat. The research was conducted during April - June 2018 at the Biomedical Laboratory of Dentistry Faculty University of Jember. This research method is experimental with pre-post control group design. The subject of research is 12 male Sprangue dawley rats, applying from LPPT 4 Universias Gadjah Mada Yogyakarta. The rats were divided into 2 groups: control and treatment. The control group was fed standard Rat Bio while the treatment group was modified diet for 6 weeks. The result of paired T-Test in the treatment group (modified diet) showed that there was significant weight difference between pretest and posttest (p = 0,01), while in control group (Rat Bio) showed no significant weight difference between pretest and postest (p = 0.05). T-test result of body weight difference between the two groups showed significant difference (p = 0,01) between control group (Rat Bio) and treatment group (modified diet), where the difference of weight gain in treatment group was higher than control group. From this study it can be concluded that feeding of modified diet has an effect on the increase in body weight of Sprangue dawley rat.

1. Introduction

Obesity are major issues for public health authorities [4]. Overweight can be due to increased consumption of high energy foods such as fats and carbohydrates with low physical activity [1].Weight gain in obesity is the result of an overall positive energy balance [2]. Obesogenic diets greatly contribute to a positive energy balance and their fat content provides approximately twice the caloric load of carbohydrates and proteins [4]. A high-calorie diet can cause weight gain and metabolic dysfunction [4]. High calories contribute to dysregulation of energy balance, overweight and obesity [5]. High-fat diets and carbohydrates with less physical activity lead to an increase in the rate of fat accumulation [3]. Fat will be deposited in the periphery and central, central fat deposits trigger the process of lipolysis to produce free fatty acids that cause increased production of glucose in the liver, reducing the absorption of glucose in the muscle and inhibits the absorption of insulin into the liver [3]. High fat diets (HFD) are suspected to promote the development of obesity through other indirect mechanisms. For instance, prior to weight gain, a significant increase in total triglyceride levels was reported after only 2 weeks in female rats submitted to HFD [4] is suggests that important physiological changes can occur early in response to HFD, and this can be detected before significant increases in body weight. In mice, obesogenic diets were also shown to alter feeding behaviors and voluntary activity [4]. Independently of body weight fluctuations, these observations imply potential impairments in the regulation of vital functions such as appetite, satiation, satiety, energy utilization/storage, sleep, and voluntary activity. Overweight and obesity is one of the risk factors of type 2 Diabetes Mellitus [3]. This study aims to determine the effect of modified diet compared to standard feed (Rat Bio) on the weight of Sprangue dawley.

2. Materials and Methods

2.1. Experimental Animals

Experimental with *pre -postest control group design* was used in this study. A total of 12 *Sprague dawley* rats who visited The Integrated Research and Testing Laboratory (LPPT 4) Gadjah Mada University at Yogyakarta was selected as research samples. The inclusion criteria of this study were male rats, age 3-4 months, weight 200-300 gram, and active motion. Exclusion citeria were dead at the time of the study. Rats are kept in Biomedical Laboratories Faculty of Dentistry at Jember University. In this study rats were divided into 2 groups, control group (n=6) and treatment group (n= 6).

2.2. Modified diet

The control group received standard feed (Rat Bio) which contained (60% carbohydrate, 20% protein, 4% fat, 4% crude fiber, 12% calcium, and 0.7% phosphorus). The treatment group received modified diet, with a composition of 50% Rat Bio, 25% Wheat Flour, 2% Cholesterol, and 5% pork oil. The modification of high-calorie diets for rats was made at the Jember State Polytechnic Feed Unit.

2.3. Determination of Body Weight

The body weight was determined using an analytic scale (OHAUS). The Rat body weight was be measured 2 times, that is before and after 6 weeks of treatment modified diet.

2.4. Statistical Analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS) version 22 software. Data are expressed as the means and standard deviations (SD). The difference in body weight before and after the study was tested by Paired T-Test. The difference in weight difference and between the two groups tested with the Independent-T Test was used to compare the differences among groups, $p < 0.05$ was considered statistically significant.

3. Results and Discussion

Statistical test results showed data on pretest and posttest weight in both groups were normally distributed ($p > 0.05$, Shapiro Wilk test), so to determine differences in body weight of rat Spangue dawley before and after the study using paired t-test.

Table 1. Statistical test results of differences in body weight between control and treatment groups

Group	Mean ± SD	Mean ± SD	p*
	Pretest	Postest	
Control	258±53,9	270,8±49,6	005
Treatment	256±8,5	291±7,7	0,01

* Paired T-Test, $p<0,05$

The mean body weight of rat before and after the study increased in both groups. The weight gain of rat in the control group showed no significant differences before and after the study. Whereas the weight gain of mice in the treatment group showed a significant difference. High Calorie Diet (HCD) could induce a vicious cycle that promotes higher calorie intake and sedentary behaviors, two major risk factors for the development of obesity and ensuing metabolic dysfunctions [4]. Some research report that only one week of HCD is sufficient to alter eating behaviors in adult mice [4]. One method that has been suggested to combat of obesity is to reduce the caloric density of foods, with the hope that reducing the number of calories per unit of food will result in lower total caloric intake [5].

Weight difference in the control group between pretest and posttest showed a mean increase in body weight of 11.5 grams, while the mean increase in body weight in the treatment group was 30.5 grams. The statistical results of independent T-Test showed a value of $p = 0.01$, which means that there were differences in body weight gain in the two groups. This shows that there is an effect of giving a high-calorie diet modification to an increase in rat body weight. This result in accordance with the theory that a high calories contribute to dysregulation of energy balance, overweight and obesity [5].

4. Conclusion

The research showed that high calorie diet modification can increase the body weight of Sprangue dawley rats**.**

Acknowledgments

The authors would like to acknowledge the Ministry of Research and Higher Education who have been willing to fund the funding source Penelitian Dosen Pemula (PDP) with a research contract 473/PL17.4/PL/2018

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